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Under the heading "Growth of Intelligence," the author discusses the stages of knowledge and the development of science. Here we deal with that function of intelligence which, unlike the esthetic interest, breaks up the individuality of things, and aims to discover their systematic relations. While distinguishing "sensory," "perceptual," and "conceptual" intelligence, the author insists that "all grades of intelligence have not only a common process or method, but exercise it about a common real object." In sensory intelligence there is a series of sensations denoting the stimulus and the reactive process. Perception begins "when a sensory object is thought as a quality, and, most simply, as a member of a group." Conception begins "in the explicit thought of connections that are implicitly thought in perceiving."

In the space at our disposal it is impossible to convey an adequate idea of the wealth of penetrating analysis which this book contains. There is scarcely any philosophical topic upon which the author does not make some instructive comment. The fundamental difficulties to which attention has been called above, together with the obscurity of style and arrangement, militate most seriously against the use of this work as a text-book or systematic treatise; but it will profit any student to refer to it for light on the epistemological approach to special problems.

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Studies from the Psychological Laboratory of Wesleyan University. Vol. I., No. 1. *Monograph Supplement, Psychological Review,* Vol. VIII., No. 4, November, 1907. Baltimore: The Review Publishing Co. Pp. iv + 92. *An Experimental Study of Visual Fixation.* RAYMOND DODGE.

Professor Dodge's experiments are directed mainly towards proving that there is no fixation point in the field of vision, and that there is no central retinal point of distinctest seeing to which every point of interest in the field of vision is brought. Instead of "fixation point," Professor Dodge proposes the term "fixation field." The eye is never perfectly still. Movements of the head, due to pulse and breathing and other irregular causes, constantly disturb visual fixation. There are no compensatory eye movements for these disturbances. Retinal fatigue is suggested as another motive of fixation movements. Vision becomes blurred when the same retinal elements are continuously excited. There is then a shifting of the eye so as to employ neighboring retinal elements. The author admits that the proof for this hypothesis is not conclusive. Still another visual motive for fixation movements is inadequate binocular adjustment. The author includes here movements of convergence and divergence.

Peripheral stimulus on the retina produces reactive eye movements to establish fixation. The peripheral stimulus may be due to a lapsed fixation or to the appearance of a new point of interest. The reactive movement of the eye will be exact, however, only occasionally and by accident, because of the slow reaction time of the eye and the intervening movements of the head. Professor Dodge measured the reaction time of the eye by letting a beam of light fall obliquely on the cornea simultaneously with the exposure of a word a little to one side of a preexposure fixation mark. The reflection of the light from the cornea was photographed on a falling plate, which registered a lateral movement of the eye as a slanting line; the record was ended when the subject shut off the light with a Cattell sound-key on beginning to speak the word he saw.

The quickest reaction obtained from exposing a 41′ word 1° 30′ to the right of the prefixation mark was 130σ. The average of 17 such exposures was 151σ; the highest, 163σ; the mean variation, 9.9σ. The experiment was varied by taking a longer distance, and sometimes exposing the word to the right, sometimes to the left, which gave, for 23 other records, longer times.

The absence of a retinal point which is brought to bear on each point of interest in the field of vision was shown by getting an after-image of an illuminated wedge and then reading a word exposed about fifteen degrees to one side of the wedge. The after-image of the wedge was seen at some point about the word. The same words were exposed in three different series. Each time the wedge was seen at a different part of each word. Only rarely did the wedge appear at the same point in successive exposures. Professor Dodge concludes: "The psychophysiological dogma that there is a tendency to transfer every peripheral stimulus to a fixed punctiform functional retinal center is a myth. There is no punctiform functional center of the retina." There is an area of indefinite extent, varying with the character of the object of regard, where vision is more distinct. This merges into a vaguely bounded peripheral area of less clear and distinct vision.

The rate at which movements of the eye succeed one another for the purpose of adequately fixating different objects, is conditioned by the rapidity of the clearing-up process. By the "clearing-up process" the author means all that has usually been called latent time, retinal inertia, and the development of retinal stimulation. Six experiments are described, in which the time of the clearing-up process was measured under different conditions of the field of vision preceding and following the exposure. A white field preceded and followed by a field partly white and partly black cleared up (that is, became as white as the preceding and following white) in from five tenths to several seconds, according to the duration of the preceding exposure. A gray field preceded by one wholly black and followed by one wholly white was not seen at all after an exposure of 90σ. The author thinks this phenomenon analogous to the illusion of clear vision during eye movements which has been the subject of recent discussion. A phrase preceded and followed by a field half black and half white did not perfectly clear up even with an exposure of 500σ. The test of perfect clearing up was absence of any difference in intensity and apparent time of appearance between the halves of the phrase that fell on the white and black. In another experiment different results were obtained when a word (complicated with another word exposure) was preceded by black and followed by white, than when the reverse was the case. Again, a horizontal line exposed before and after the word rendered the word uncertain. Several horizontal lines, however, cleared it up. A group of vertical lines almost completely obliterated it. The shortest adequate fixation pause in reading is given as between 70 and 80σ.

The apparatus that was used for determining the reaction time of the eye was also used to measure the fixation movements of the eye in reading. Every fixated object is seen in a more or less complicated setting. Peripheral seeing plays an important part in reading. Dearborn's hypothesis that the eye in the first fixation takes a more general survey of the line as a whole than in later fixations was confirmed. The exact position of the point of regard is not important. It may be at any part of a word. No one factor determines its precise position. The object of interest is not a point, but an area.

In his last chapter, Professor Dodge attacks the "traditional theory of motor local signs," according to which the retinal elements are differentiated and organized by the mediation of kinesthetic feelings that accompany the movements of the eye in bringing peripheral stimuli to the center. Professor Dodge asserts that there is "not one particle of unambiguous experimental evidence that can be adduced to its support." Neither the velocity nor the extent of our eye movements is known to us. Adequate sensations of eye movements do not exist. There is no evidence of any motion to bring stimulations of the fovea itself to its exact center. Professor Dodge proposes instead a theory of the "genetic organization of the retinal elements." If we suppose a retina in which the elements have not been mutually related and differentiated, then association into groups must soon take place through similar excitation of contiguous elements by the same patches of stimulus. Movements of the eye would bring different retinal elements into association—a single patch of stimulus now covering one group, now another which partly overlapped the first, and then a third which partly overlapped the first two, and so on. Each element of the retina would thus become related to all the other elements. Movements of the eye simultaneous with the shifting of patches of stimulus would relate the retinal organization with the organization of motor impulses. "This association must tend to standardize the group organization at various parts of the retina."

It is not clear whether Professor Dodge's theory is intended to explain the origin of retinal local signs, or the origin of the feeling of spatial relationship between them. He seems to mean local signs when he speaks of "the group differential organization of the retinal elements"; and the sentence "The psychological aspects of the retinal organization are given in the spatial relations of the various parts of the field of view," seems to mean that space relations are given immediately by the physiological differentiation of the retinal elements. On the other hand, the author goes on to speak of "a certain relatively late and relatively gross organization of the motor impulses," coordinated with the retinal organization, and serving as "a connecting bond between the organization of visual and the organization of tactual elements." The coordination of the visual relationships "with the relationships of the tactual sense" produces "the complex organization of our sensory experience which we have given in immediate consciousness as space." If "group organization of the retinal elements" means the same as local signs, and the theory stops there, it is inadequate to explain spatial perception. If "organization of the motor impulses" is added, it is not clear how this theory gets beyond the one criticized.

A discussion of the technique of recording the eye movements is given in an appendix.

A. LIPSKY.

NEW YORK CITY.

Moral Training in the Public Schools. The California Prize Essays. CHARLES EDWARD RUGH, T. P. STEVENSON, EDWIN DILLER STARBUCK, FRANK CRAMER and GEORGE E. MYERS. Boston: Ginn & Co. 1907. Pp. 203.

The subject of moral training in the elementary schools of America is perhaps more widely discussed to-day than at any previous period in our history, and the present volume is certain to be hailed as timely. A citizen of California, who withheld his name, recently placed in the hands of the Reverend Charles R. Brown, a pastor at Oakland, California, President David Starr Jordan, of Stanford University, and Professor Fletcher B. Dresslar, of the University of California, the sum of eight hundred dollars to be awarded as first ($500) and second ($300) prizes for the best essays on "Moral Training in the Public Schools."

Three hundred essays, "many of them of high merit," as the committee affirms, were submitted, and the first and second prizes were awarded, respectively, to Mr. Rugh and Mr. Stevenson. But three other essays—those by Messrs. Starbuck, Cramer, and Myers—seemed to offer such distinct and individual contributions to the discussion of the problem that they were included with the publication of the two prize essays.

Mr. Rugh's essay is the most notable of the series, and is most suggestive to the student of pedagogics. His familiarity with the literature of ethics and genetic psychology is evident, and he manifests a clear insight into the needs of the public schools. Mr. Stevenson's opposition to the parochial school supported by public funds is one of the clearest statements that has come to the attention of the reviewer. The paper by Mr. Myers is chiefly valuable because of the brief, but excellent, exposition of conditions in Germany, France, and England with reference to moral training in the schools.

On one phase of the problem all the essayists are agreed, viz., that a secular system of education would be antagonistic to our national character and out of harmony with American political institutions. Mr. Stevenson asserts that sectarian school systems do not make good citizens, but devoted members of their respective sects.

The personality of the teacher is emphasized as the most potent factor in moral training, and several of the essayists lament the absence of the male teacher in the elementary schools of the United States, assuming